

## CLAIMS

The invention is claimed as follows:

1. A belt conditioning apparatus for a belt having a water impermeable surface  
5 and a face-side roll that contacts the water impermeable surface, the belt traveling continuously in a paper machine, the apparatus comprising:  
a chemical shower placed proximate to the face-side roll, the shower operable to spray a conditioning chemical on the water impermeable surface or the face-side roll.  
10
2. The belt conditioning apparatus of Claim 1, wherein the chemical is based on a neutral, acidic or alkaline formula.
3. The belt conditioning apparatus of Claim 1, wherein the chemical is selected  
15 from the group consisting of: (i) anionic, nonionic and amphoteric surfactants; (ii) solvents including glycol ethers, D-limonene and low molecular weight alcohols; (iii) aliphatic and aromatic hydrocarbon solvents; (iv) acid-based cleaners including mineral acids, hydrochloric acid, sulfuric acid, organic acids, citric acid, glycolic acid and alkyl sulfonic acids; (v) corrosion inhibitors including filming amines and  
20 chelators; (vi) alkaline cleaners including hydroxides, silicates and inorganic phosphates; and (vii) any combination or derivative thereof.
4. The belt conditioning apparatus of Claim 1, wherein the shower is an oscillating shower, a doctor blade shower, a high pressure shower or any combination  
25 thereof.
5. The belt conditioning apparatus of Claim 1, wherein the shower operates additionally with water, and which includes a doctor blade positioned operably relative to the high pressure shower.

30

6. The belt conditioning apparatus of Claim 5, which includes a backing roll placed on the backside of the belt, the backing roll operable to provide an adequate counteracting force against the doctor blade.
- 5 7. The belt conditioning apparatus of Claim 1, wherein the shower is placed directly before or directly after the face-side roll with respect to the direction of travel of the belt.
8. The belt conditioning apparatus of Claim 1, wherein the shower is a first  
10 shower placed before the face-side roll and which includes a second shower placed after the face-side roll with respect to a direction of travel of the belt.
9. The belt conditioning apparatus of Claim 8, wherein the second shower sprays:  
15 (i) the same conditioning chemical; (ii) a different conditioning chemical; or (iii) water onto the water impermeable surface.
10. The belt conditioning apparatus of Claim 1, wherein the face-side roll is a first face-side roll and the shower is a first shower, wherein the belt is contacted by a second face-side roll, and which includes a second shower placed proximate to the  
20 second face-side roll.
11. The belt conditioning apparatus of Claim 10, wherein the second shower sprays: (i) the same conditioning chemical; (ii) a different conditioning chemical; or  
25 (iii) water onto the water impermeable surface.
12. The belt conditioning apparatus of Claim 1, which includes a face-side driven roll positioned against the water impermeable surface.
13. The belt conditioning apparatus of Claim 12, wherein the face-side driven roll  
30 includes at least one feature selected from the group consisting of: (i) being positioned before the face-side roll; (ii) being driven at a different speed than the belt; and (iii) being conditioned with at least one of a doctor blade and a chemical shower.

14. The belt conditioning apparatus of Claim 12, wherein the face-side driven roll is conditioned with a chemical selected from the group consisting of: (i) low molecular weight polyamines; (ii) low molecular weight polyamines in combination with nonionic surfactants including ethoxylated alcohols and cationic surfactants and quaternary ammonium compounds; (iii) aliphatic organic solvents including kerosene, iso-paraffins and mineral oil; (iv) organic solvents in combination with nonionic surfactants including silicone-based surfactants and anionic surfactants including phosphate esters and fatty acid salts; (v) dispersants including naphthalene-formaldehyde condensates, naphthalene sulfonates and alkanolamides; and (vi) any combination or derivative thereof.

15. The belt conditioning apparatus of Claim 1, which includes a backing roll placed on an opposite side of the belt from the face-side roll, the backing roll creating a press nip with the face-side roll.

16. The belt conditioning apparatus of Claim 1, which includes a doctor blade positioned against the impermeable surface of the belt and a backing roll operable to provide an adequate counteracting force against the doctor blade.

20

17. A paper machine comprising:  
a press section operable to mechanically press moisture from a fibrous web;  
a dryer section operable to evaporate moisture from the web;  
a continuous belt operable with at least one of the press section and the dryer section, the belt having a water impermeable surface; and  
a chemical shower placed proximate to the belt, the shower operable to spray a conditioning chemical onto the water impermeable surface.

18. The paper machine of Claim 17, wherein the fibrous web is of a type selected from the group consisting of: a paper web and a paperboard web.

30

19. The paper machine of Claim 17, wherein the water impermeable surface is located on a face-side of the belt or on a backside of the belt.

20. The paper machine of Claim 17, which includes a face-side roll that contacts the water impermeable surface, and wherein the shower is located directly before, adjacent to or directly after the face-side roll with respect to a direction of travel of the belt.

21. The paper machine of Claim 17, wherein the chemical is selected from the group consisting of: (i) anionic, nonionic and amphoteric surfactants; (ii) solvents including glycol ethers, D-limonene and low molecular weight alcohols; (iii) aliphatic and aromatic hydrocarbon solvents; (iv) acid-based cleaners including mineral acids, hydrochloric acid, sulfuric acid, organic acids, citric acid, glycolic acid and alkyl sulfonic acids; (v) corrosion inhibitors including filming amines and chelators (EDTA, DPTA); (vi) alkaline cleaners including hydroxides, silicates and inorganic phosphates; and (vii) any combination or derivative thereof.

22. The paper machine of Claim 17, wherein the belt is operable to transfer the web from the press section to the dryer section.

20

23. A paper machine belt conditioning method comprising the steps of:

spraying a conditioning chemical onto a water impermeable surface of a continuous rotating belt at a location where a fibrous web that travels with the belt has been pulled away from the belt so that deposits: (i) can be removed from the impermeable surface of the belt or (ii) are prevented from accumulating on the belt when the surface is remated with a portion of the fibrous web.

24. The belt conditioning method of Claim 23, which includes spraying the chemical onto the impermeable surface at a place where the surface contacts a face-side roll.

30

25. The belt conditioning method of Claim 24, which includes supporting the face-side roll from an opposite side of the belt from the roll.

26. The belt conditioning method of Claim 24, which includes spraying the belt immediately before and immediately after of the face-side roll with respect to a direction of travel of the belt.

27. The belt conditioning method of Claim 24, which includes using different chemicals to spray the belt at the input and return sides, respectively, of the face-side roll.

28. The belt conditioning method of Claim 24, which includes spraying the conditioning chemical directly onto the face-side roll.

29. The belt conditioning method of Claim 23, which includes doctoring/wiping the belt with at least one member and placing a backing roll behind the belt to provide an adequate counteracting force against the member.

30. The belt conditioning method of Claim 23, which includes spraying the conditioning chemical onto a face-side of the belt at multiple locations.

31. The belt conditioning method of Claim 23, wherein the conditioning chemical is a first chemical and which includes the step of spraying a second different conditioning chemical onto the impermeable surface of the belt.

25

32. The belt conditioning method of Claim 23, wherein the conditioning chemical is a first chemical and which includes the step of spraying a second different conditioning chemical onto the belt that aids in removing residue from the first chemical.

30

33. The belt conditioning method of Claim 23, which includes the step of dewatering the impermeable surface with at least one member.

34. The belt conditioning method of Claim 33, wherein the member is selected from the group consisting of: a doctor blade, a felt roll and a suctioning device.